(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 150 686**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **84830290.7**

(22) Date of filing: **26.10.84**

(51) Int. Cl.⁴: **B 64 F 1/28**

(30) Priority: **15.12.83 IT 4951983**

(43) Date of publication of application: **07.08.85 Bulletin 85/32**

(84) Designated Contracting States: **DE FR GB**

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(54) **An extensible cylinder and piston unit for supporting a vertically moving platform carrying a delivery device and feeding thereto a fluid under pressure from an underlying stationary tank.**

(57) An extensible cylinder and piston unit for supporting a vertically moving platform carrying a delivery device and feeding thereto a fluid under pressure from an underlying stationary tank, which comprises a double effect hydraulic extensible cylinder and piston unit supporting the platform moving vertically relative to a stationary base such as a hole in the ground, adapted to receive said platform carrying a device for delivering a fluid under pressure, said unit being both the platform operating member and a member for feeding a fluid under pressure from a stationary tank to said platform.

EP 0 150 686 A2

"An extensible cylinder and piston unit for supporting a vertically moving platform carrying a delivery device and feeding thereto a fluid under pressure from an underlying stationary tank".

This invention refers to an extensible cylinder and piston unit for supporting a vertically moving platform carrying a delivery device and feeding thereto a fluid under pressure from an underlying stationary tank.

A unit of this type is particularly, even if not exclusively, used in the installations provided for feeding the fuel under high pressure to an airplane refueling hose mounted on a platform vertically moving from a lowered position, wherein it is completely received within a hole in the ground to a raised position relative to a fuel intake within the hole which is connected to a main feeding tank.

These installations are widely used at present in airports for refueling aircraft and the main characteristic thereof is the need of delivering big quantities of fuel under extremely high pressures.

At present this problem is mainly solved by connecting the main pipe either to the secondary pipe carried by the moving platform or to each secondary pipe by means of a flexible pipe having a certain length sealingly connected to the main feeding pipe at one end and to the secondary pipe at the other end thereof.

The above-mentioned flexible pipes are known in the art as well as the serious drawbacks, such as cracks and bursts, to which they are subject in use, particularly when high fuel rates are delivered at high pressure.

It is an object of the invention to provide an extensible unit of completely new construction which allows the stationary source of fuel under pressure to be safely, permanently and reliably connected to the hose delivery device placed on the moving platform, but also acts as a platform supporting and lifting member.

More particularly the invention refers to a lifting hydraulic cylinder and piston unit having

a double effect, which unit also comprises an extensible pipe for feeding the fuel from a separate underground tank to the platform.

The hydraulic cylinder and piston unit of the invention comprises a hollow piston having an air lock ~~similarly~~ provided with a through axial bore and a fuel feeding pipe placed within the hollow piston and fitted in the bore of the air lock which is sealingly engaged both with the inner wall of the cylinder and with the outer wall of the fuel feeding pipe, thus allowing the cylinder and the feeding pipe to slide with respect to the piston. This allows the platform to be lifted maintaining the connection of the underground tank with the delivery hose carried by the platform in all the possible positions thereof, that is from the completely lowered to the completely raised position of the platform.

More particularly, the cylinder and the inner connecting pipe will be integrally formed with one of the relatively moving portions, either the platform or the bottom of the platform receiving hole, while the piston is integrally formed with the other relatively moving portion, hole bottom or platform, the connection being obtained through the hollow

body of the piston and the bore of the inner pipe, as it will be more particularly described.

In the embodiment which will be described with reference to the drawings the piston is integrally formed with the platform receiving hole while the cylinder-inner feeding pipe assembly is integrally formed with the platform. It is intended, however, that the unit will work very well also inverting the position of the members thereof.

The invention will be now described in detail with reference to the annexed drawings wherein:

Figure 1 is an axial sectional view of the unit of the invention showing the platform in the completely lowered position wherein it is completely received in the hole; and,

Figure 2 is a similar sectional view of the unit showing the platform in the completely raised position.

With reference to Figure 1, the connecting unit generally referred to by numeral 10 substantially comprises three coaxial pipes.

Outer pipe 11, which is the cylinder of the unit, and inner pipe 13, which is the feeding pipe, are integrally formed with platform 14, while central pipe 12, which is the hollow piston of the unit,

is integrally formed with slab 15 of hole BC which receives the platform in the completely lowered position thereof.

The bore of pipe 12 is connected to the fuel tank, not shown in the figure, and comprises a ring-shaped air lock 16 at the upper end thereof.

Air lock 16 has an outer diameter slightly shorter than the inner diameter of pipe 11, while the diameter of the inner bore thereof is slightly longer than the outer diameter of inner pipe 13.

Furthermore, bottom 21 of outer pipe 11 forming the cylinder has an axial circular opening having a diameter slightly longer than the outer diameter of central piston pipe 12.

A pair of sealing members referred to by numerals 19 and 20 respectively are placed on both the outer cylindrical wall of air lock 16 and the inner cylindrical wall of the axial bore thereof. Sealing members 19 and 20 sealingly engage with the inner wall of cylinder 11 and the outer wall of inner pipe 13.

Finally, a pair of sealing members referred to by numeral 22 are placed on the inwardly facing annular edge of the circular opening formed in the bottom of cylinder 21.

As it is clearly shown in the figures, unit 10 thus comprises an upper annular chamber referred to by numeral 23 and a lower annular chamber referred to by numeral 24. Air lock 16 separates chambers 23 and 24 from each other, which chambers have varying volumes according to the position of air lock 16 within cylinder 11 since, as described above, air lock 16 and the two integral pipes of platform 14 can slide with respect to each other, as it will be more fully described.

Furthermore, inner bore 25 of inner pipe 13 is in connection with inner bore 26 of pipe 12 forming the hollow piston and accordingly, it is also in connection with the fuel feeding tank.

Finally, since fuel delivery hose 27 is connected through supporting wheel 28 thereof to the upper end of inner pipe 13, the fuel under pressure can be fed from the tank to the hose.

Finally, the wall of cylinder 11 comprises two fittings 29 and 30 which communicate with annular chambers 23 and 24, respectively. Thus, when fittings 29 and 30 are connected to a tank of a suitable incompressible liquid, not shown in the figure, and two delivery pipes referred to by numerals 31 and 32, respectively, through an

hydraulic pump 33, it will be possible to apply a pressure either to upper annular chamber 23, thus causing the platform to be lifted, or to lower annular chamber 24, thus causing the platform to be lowered.

As shown in the figures, hydraulic pump 33 can be supported by a bracket integrally formed with outer cylinder 11.

This structure has a further advantage in that it allows platform 14 to rotate about axis AX of the unit at any position thereof.

CLAIMS

1.- A double effect hydraulic extensible cylinder and piston unit adapted to support a platform moving vertically relative to a stationary base such as a hole in the ground adapted to receive said platform carrying a device for delivering a fluid under pressure, said unit being both the platform operating member and a member for feeding a fluid under pressure from a stationary tank to said platform.

2.- The extensible cylinder and piston unit according to claim 1, comprising a first outer pipe (11), a second intermediate pipe (12) and a third inner pipe (13), coaxially fitted one within the other, wherein said outer pipe (11) and said inner pipe (13) are integrally formed with one of the relatively moving parts, either said stationary base or said moving platform, while said second intermediate pipe (12) is integrally formed with the other moving part, either said platform or said stationary base, and comprises a cylindrical air lock (16) at the outer end thereof, said lock having a through axial bore and sealingly sliding against both the inner wall of said outer pipe (11) and the outer wall of said inner pipe (13).

3.- The extensible cylinder and piston unit according to claim 2, wherein said outer pipe (11) and said inner pipe (13) are integrally formed with said platform (14), while said intermediate pipe (12) is integrally formed with said slab (15) of said hole receiving said platform in the completely lowered position thereof.

4.- The extensible cylinder and piston unit according to claim 2, wherein said outer pipe (11) is the cylinder of the hydraulic unit.

5.- The extensible cylinder and piston unit according to claim 2, wherein said central pipe (12) is the piston of said unit.

6.- The extensible cylinder and piston unit according to claim 2, wherein said inner pipe (13) is connected to a fuel delivery hose (27).

7.- The extensible cylinder and piston unit according to claim 3, wherein said central pipe (12) is connected to said fuel feeding tank.

8.- The extensible cylinder and piston unit according to claim 2, wherein the bore (25) of said fuel feeding pipe (13) and the bore (26) of said hollow piston (12) are in free communication at any relative position thereof.

9.- The extensible cylinder and piston unit ac-

cording to claim 2, wherein said annular air lock (16) has an outer diameter slightly shorter than the inner diameter of said cylinder (13) while the diameter of the inner bore thereof is slightly longer than the outer diameter of said inner pipe (13).

10.- The extensible cylinder and piston unit according to claim 9, wherein a pair of high pressure sealing members (19 and 20) are placed on both the outer cylindrical wall of said air lock (16) and the inner cylindrical wall of the axial bore thereof, said sealing members operating against both the inner wall of said cylinder (11) and the outer wall of said inner pipe (13).

11.- The extensible cylinder and piston unit according to claim 4, wherein the bottom (21) of said outer pipe (11) has a circular opening slightly larger than the outer diameter of said intermediate piston pipe (12).

12.- The extensible cylinder and piston unit according to claim 11, wherein a pair of high pressure sealing members (22) are placed on the inwardly facing annular edge of the circular opening formed by the bottom of said cylinder (21).

13.- The extensible cylinder and piston unit according to claim 1, comprising an upper annular

chamber (23) comprised between the outer annular face of said air lock (16) and the close bottom of said outer pipe (11), and a lower annular chamber (24) comprised between the inner annular face of said air lock (16) and the bottom (21) of said outer pipe (11), said chambers being separated from each other by the air lock and having varying volumes according to the position of said air lock within said cylinder (11).

14.- The extensible cylinder and piston unit according to claim 13, wherein said annular chambers (23 and 24) are connected to a fitting (29 and 30, respectively) for feeding thereto a hydraulic fluid under pressure from a hydraulic pump (33).

15.- The extensible cylinder and piston unit according to claim 14, wherein said hydraulic pump (33) is supported by a bracket integrally formed with said outer cylinder (11), thus allowing said platform (14) to rotate about the axis (AX) of said unit.

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FIG.1

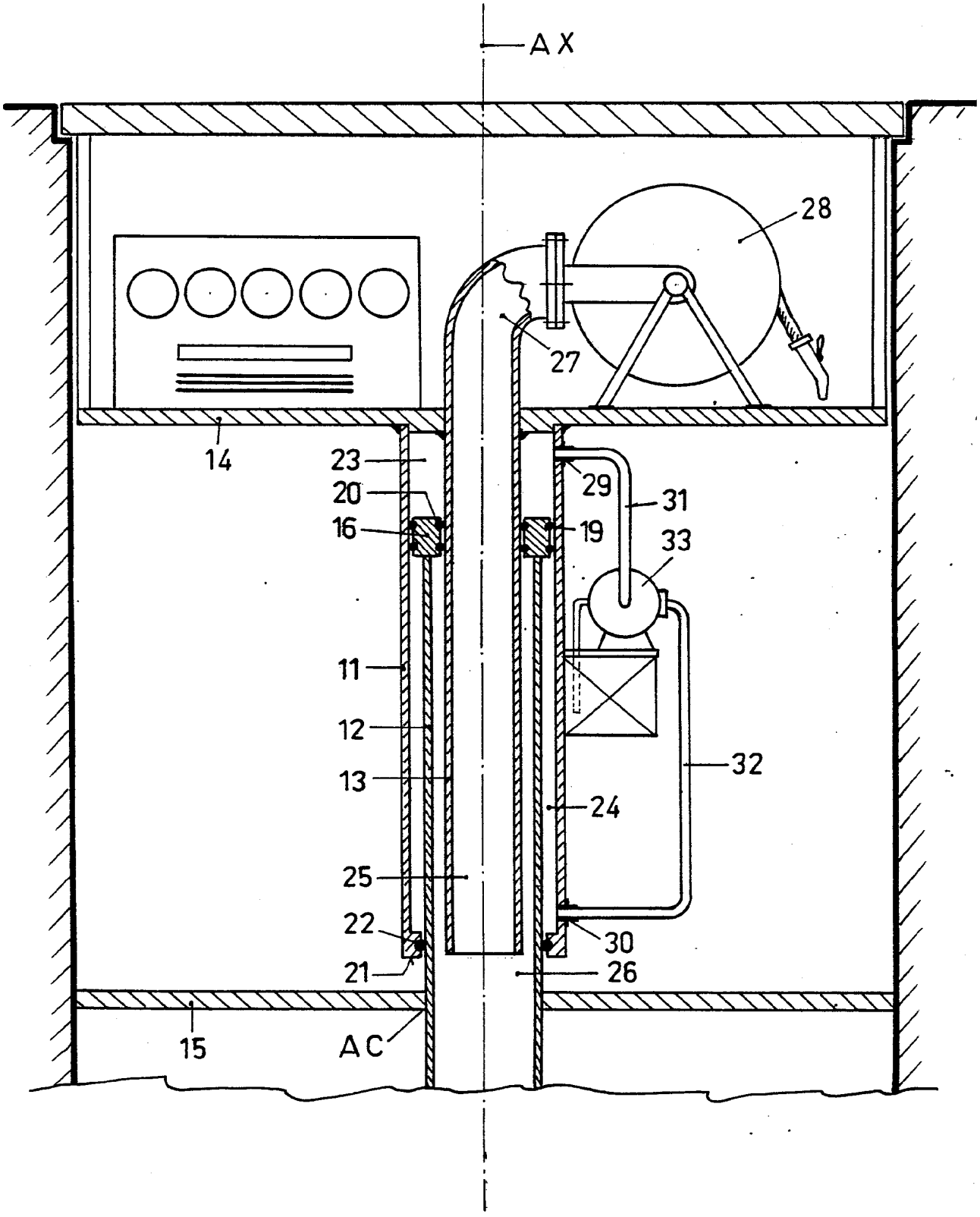
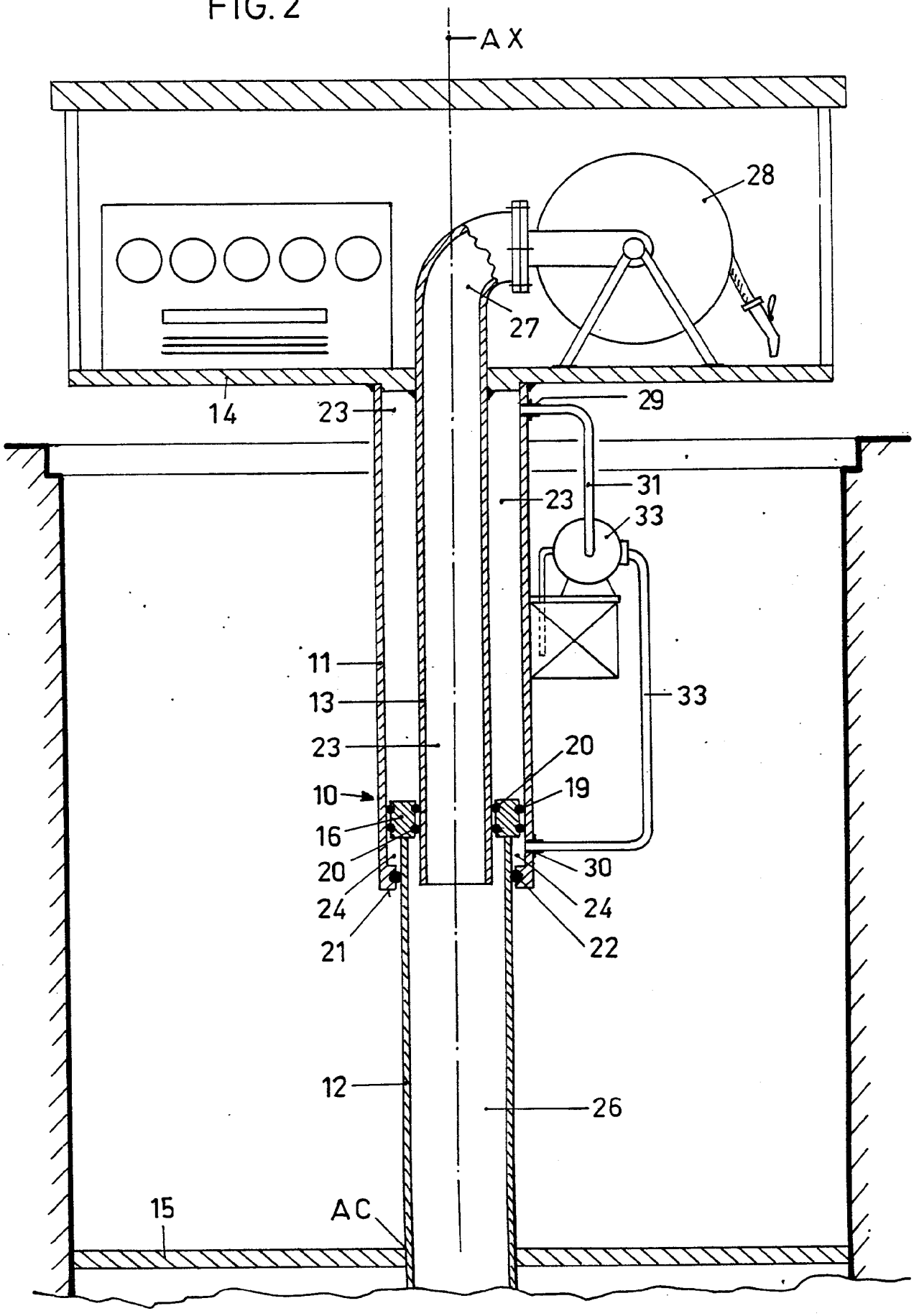


FIG. 2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